Department of Personnel & Administration

Division of Central Services Performance Contract

State Buildings &
Real Estate Programs
Project No. IH-02035
1313 Sherman Street
Denver, Colorado

May 22, 2006

COLORADO STATE CAPITOL COMPLEX

- 16 Buildings located in the Denver metro area and 1 Building in Grand Junction.
- 1.8 million square feet.
- Building age from 1890's to 1970's
- Existing HVAC Equipment dating back to the 1930's.

Pre-Performance Contract Cooling Systems

- COOLING
- 8 Downtown Buildings are on a Central Chiller Plant.
  - One 650 ton absorption chiller
  - One 650 Ton Centrifugal Chiller
  - One Remote 650 Centrifugal Chiller
  - The rest of the buildings have independent systems and several buildings either have partial cooling or window units.

Infrastructure

- Tunnel System connecting 9 buildings
  - Originally used for moving coal
  - Summer time it was part of the Capitol natural ventilation cooling system.
  - Today it is used for steam, electrical, chilled water, voice/data and electrical distribution.

Pre-Performance Contract Heating Systems

- HEATING
- 9 Downtown Buildings on the XCEL Steam Loop with one High Pressure Boiler leased to XCEL. Two 1930's boilers were abandoned in place in the 60's.
  - Two buildings have electric heat
  - The rest of the buildings have either hot water boilers or gas fired roof top units..

Pre-Performance Contract Controls

- CONTROLS
- Mixture from bridle loops to Siemens DDC controls to pneumatic controls to manual controls.

DPA/Central Services Performance Contract

- PROJECT TEAM
- Central Services Maintenance Personnel
- State Buildings and Real Estate Programs
- OEMC Consultants for M&V, Commissioning Oversight and Contract Review.
- Chevron Energy Solutions
- Colorado Department of Labor and Employment
- Judicial and Higher Education through the Judicial Heritage Complex

APPROVAL AND KEY PERSONNEL

- Upper Management Approval
- Mid Management Permission

- Maintenance Staff
  - Job Security
  - Current Maintenance Practices

AUDIT PHASE

- Allowed us to evaluate entire systems not small pieces as we had in the past
- 35 ECM's were identified

  12 ECM's were viable projects
- 5 Projects were leveraged to pay for other work.
  - Lighting
  - Water Conservation
  - DDC Controls
  - Chilled Water Improvements
  - Optimize Chiller Controls

PHASE I

Lighting 18 Buildings	$820,000
Water Conservation 13 Buildings	$137,229
Upgrade DDC Controls	$784,470
Central Plant Improvements	$696,859
Optimize Chiller Controls	$659
Water Side Economizers (Flat Plates)	$188,563
Replace Chiller, Pumps and Tower	$617,736
Replace District Steam w/ Boilers	$2,236,523
Add Insulation Weather Stripping	$17,065
Delete Unused Water Meters	$0
Energy Conservation Manager	$95,238
Direct Purchase of Natural Gas	$0

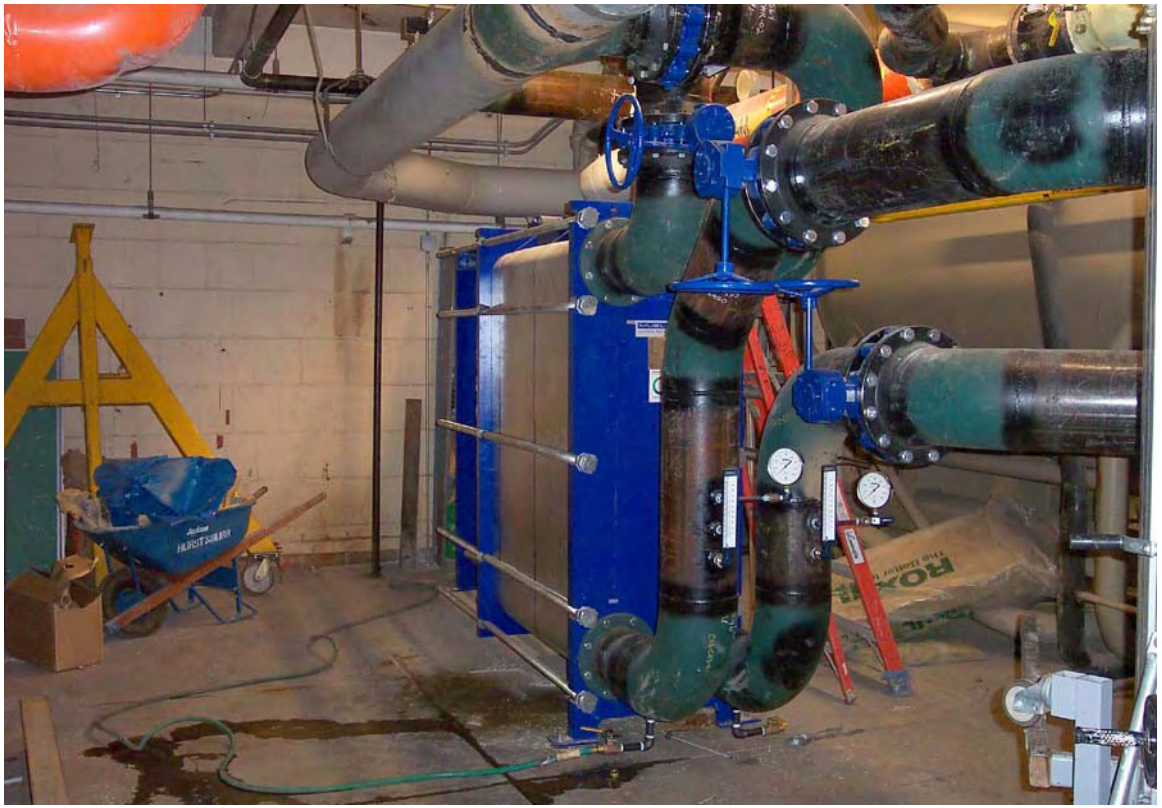
PHASE II

Rolled in from Phase I	$1,483,411
Lighting Controls 1 Building	$32,960
Expand DDC Controls	$123,023
Install Water Side Economizers (Flat Plates)	$322,432
Replace Central Plant Chiller & Add Cooling Tower	$496,585
New Chiller Plant at 690 & 700 Kipling	$1,825,273
Replace District Steam with Boilers (Judicial)	$0
Replace Boiler at CDLE	$181,280
Replace Windows at CDLE	$262,595
Misc. projects from back up pumps to VFD's	$773,488
Energy Star Rating and LEED-EB for three buildings	*In Above*

Central Plant Improvements

Pump Room Improvements

Flat Plates



Cooling Towers

Utility Budget Savings

2005 Utility Budget	$3,260,396
Phase I Guaranteed Savings	$ 631,000
Phase II Guaranteed Savings	$ 179,000
Phase II Guaranteed Savings	$?----
	$2,450,396

25% Saving on Utility Budget $810,600

Environmental Savings

Phase I 7,508,849 Phase II 2,111,152 kWH saved

Fuel Type	Acid Rain	Smog	Acid Rain
Phases I	CO2 lb/k/wh	NOx g/k/wh	SO2 g/k/wh
Coal Not Burned	18,021,238	30,035,396	75,088,490
Oil Not Burned	15,017,698	14,266,813	40,547,785
Gas Not Burned	9,761,504	157,685,829	0
Phase II			
Coal Not Burned	5,066,765	8,444,608	21,111,520
Oil Not Burned	4,222,304	4,011,189	11,400,221
Gas Not Burned	2,744,498	44,334,192	0

COLORADO LEED- EB PILOT PROGRAM

- JUDICIAL/HERATIGE CENTER 1976
  - DPA only pays utility bills
- STATE SERVICES 1957
  - Multi Tenant Building
- HUMAN SERVICES BUILDING 1953
  - Single Tenant

LEED EB Implementation

- Energy Star Rating 60 or better
- Continuous Commissioning as part of Audits
- High Performance Operations
- Energy Savings Monitoring
- EPP Pilot Program
- Records Management

Performance Contract Lessons Learned

- Look at entire systems not components.
- Flexible ESCO and Budgets. GMP pricing on each ECM
- Lighting pays for other work. Leverage the ECM
- Design work is not complete at time of Audit
- Energy Star ratings give you a benchmark.
- Size of the building does not matter.
- Plan for LEED EB
- Maintenance Staff
  - History of Equipment
  - Cooperation they need to buy into the new systems for future maintenance.
  - Recommendations

LEED EB
Lessons Learned

- Justification
- Start Early
- Go back and look at all systems again.
- Staff Buy-in, Education
  - Enhanced Operations and Performance
  - On-Going monitoring
- Tenant Buy-in
- Identify your Performance Period
- Green Housekeeping and Contracting obligations.
- More Lessons to be learned. We are just starting.

Colorado Department of Labor and Employment

LEED - NC Version 2.0
Certified August 1, 2005
Project Number 1887

251 East 12th Avenue
Denver, Colorado

Project requirements for LEED®

- No impact to budget, schedule, or program.
- Cost savings through energy efficiency.
- Extend the lifespan of existing building.
- Employee wellness.
- Good design, common sense.
- Quality of architects, engineers, contractors.
- Governor Owens' Greening State Government Executive Order.

LEED is a registered trademark of the U.S. Green Building Council www.usgbc.org/leed

CDLE Project Facts

- 40,000 square foot addition.
- Original construction 1956.
- Approximate cost per square foot = $100.
- Federally funded, prevailing wage.
- 180 Unemployment Insurance employees (450 total).
- Conference, training, break rooms.
- Ground breaking December, 2003.
- Occupancy December, 2004.

LEED-NC

State of Colorado Department of Labor and Employment

LEED® Project # 1887

LEED Version 2 Certification Level: CERTIFIED

August 1, 2005

28 Points Achieved — Possible Points: 69

Certified 26 to 32 points; Silver 33 to 38 points; Gold 39 to 51 points; Platinum 52 or more points

6 Sustainable Sites — Possible Points: 14

Y			
Y	Prereq 1	**Erosion & Sedimentation Control**	
1	Credit 1	**Site Selection**	1
1	Credit 2	**Urban Redevelopment**	1
	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Alternative Fuel Refueling Stations	1
	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
	Credit 5.1	**Reduced Site Disturbance**, Protect or Restore Open Space	1
	Credit 5.2	**Reduced Site Disturbance**, Development Footprint	1
	Credit 6.1	**Stormwater Management**, Rate and Quantity	1
	Credit 6.2	**Stormwater Management**, Treatment	1
1	Credit 7.1	**Landscape & Exterior Design to Reduce Heat Islands**, Non-Roof	1
1	Credit 7.2	**Landscape & Exterior Design to Reduce Heat Islands**, Roof	1
1	Credit 8	**Light Pollution Reduction**	1

1 Water Efficiency — Possible Points: 5

Y			
	Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
	Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
	Credit 2	**Innovative Wastewater Technologies**	1
1	Credit 3.1	**Water Use Reduction**, 20% Reduction	1
	Credit 3.2	**Water Use Reduction**, 30% Reduction	1

4 Energy & Atmosphere — Possible Points: 17

Y			
Y	Prereq 1	**Fundamental Building Systems Commissioning**	
Y	Prereq 2	**Minimum Energy Performance**	
Y	Prereq 3	**CFC Reduction in HVAC&R Equipment**	
2	Credit 1.1	**Optimize Energy Performance**, 20% New / 10% Existing	2
	Credit 1.2	**Optimize Energy Performance**, 30% New / 20% Existing	2
	Credit 1.3	**Optimize Energy Performance**, 40% New / 30% Existing	2
	Credit 1.4	**Optimize Energy Performance**, 50% New / 40% Existing	2
	Credit 1.5	**Optimize Energy Performance**, 60% New / 50% Existing	2
	Credit 2.1	**Renewable Energy**, 5%	1
	Credit 2.2	**Renewable Energy**, 10%	1
	Credit 2.3	**Renewable Energy**, 20%	1
1	Credit 5	**Additional Commissioning**	1
	Credit 4	**Ozone Depletion**	1
	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1

5 Materials & Resources — Possible Points: 13

Y			
Y	Prereq 1	**Storage & Collection of Recyclables**	
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Shell	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Shell	1
	Credit 1.3	**Building Reuse**, Maintain 100% Shell & 50% Non-Shell	1
1	Credit 2.1	**Construction Waste Management**, Divert 50%	1
	Credit 2.2	**Construction Waste Management**, Divert 75%	1
	Credit 3.1	**Resource Reuse**, Specify 5%	1
	Credit 3.2	**Resource Reuse**, Specify 10%	1
1	Credit 4.1	**Recycled Content**	1
1	Credit 4.2	**Recycled Content**	1
1	Credit 5.1	**Local/Regional Materials**, 20% Manufactured Locally	1
1	Credit 5.2	**Local/Regional Materials**, of 20% Above, 50% Harvested Locally	1
	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

8 Indoor Environmental Quality — Possible Points: 15

Y			
Y	Prereq 1	**Minimum IAQ Performance**	
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	
1	Credit 1	**Carbon Dioxide** (CO_2) **Monitoring**	1
	Credit 2	**Increase Ventilation Effectiveness**	1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints	1
1	Credit 4.3	**Low-Emitting Materials**, Carpet	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood	1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
	Credit 6.1	**Controllability of Systems**, Perimeter	1
	Credit 6.2	**Controllability of Systems**, Non-Perimeter	1
1	Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-1992	1
	Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	1
	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

4 Innovation & Design Process — Possible Points: 5

Y			
1	Credit 1.1	**Innovation in Design**: Green Housekeeping	1
1	Credit 1.2	**Innovation in Design**: Exemplary Performance of MRc5.1	1
1	Credit 1.3	**Innovation in Design**: Exemplary Performance of MRc4.1/4.2	1
	Credit 1.4	**Innovation in Design**:	1
1	Credit 2	**LEED® Accredited Professional**	1

LEED-NC Certified

	Total Possible	Attempted	**Achieved**
Sustainable Sites	14	6	**6**
Water Efficiency	5	3	**1**
Energy & Atmosphere	17	6	**4**
Materials & Resources	13	5	**5**
Indoor Environmental Quality	15	10	**8**
Innovation & Design	4	4	**4**
TOTAL	69	34	**28**

Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more

Assistance and Support for LEED Process

Technical Assistance provided by The Governor's Office of Energy Management & Conservation:

- High performance design grant
- LEED application review
- Training and testing fees for LEED AP accreditation

Rebuild COLORADO

www.colorado.gov/rebuildco

Lessons Learned

- Design with LEED in mind.
- Document everything.
- Requires management support, not participation.
- Champion required.
- Use the experts.
- Use LEED as part of the decision-making process.
- LEED buildings are “normal” buildings, in fact they are great buildings.
- Be willing to make trade offs.
- Assume some credit submissions will be denied.
- LEED does not have to impact budget, schedule, or program.
- LEED principles can be applied to other projects.